DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claims 1-4, 6, 10, 12-13 and 20-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Demuth et al. (WO 03//054467) in view of Aisin Seiki Co. (JP 2000-304380).

Re. Cls. 1-3, Demuth discloses a heat exchanger for a supercritical refrigeration cycle and described the following technical features (referring to line 21 of page 18 to line 16 of page 19, line 29 of page 30 to line 11 of page 31 and fig. 1): A heat exchanger for motor vehicles, having a block comprising tubes and fins, it being possible for a gaseous medium, to flow over the fins, and it being possible for a second medium, in particular a refrigerant, to flow through the tubes, which are arranged in a plurality of rows, in particular in cross-countercurrent to the gaseous medium, wherein the tubes are arranged in series in the direction of flow of the gaseous medium.
The features not disclosed by D1 are only that the tubes are at least four rows of tubes. But this difference is disclosed by fig. 8 of D2 (JP ~j~ 2000-304380A). Thus the claim I does not possess inventiveness provided by Article 22(3) of the Chinese Patent Law

Demuth's invention fails to disclose the tubes are at least four, five and six rows of tubes.

However, Aisin Seiki teaches the tubes are at least four rows of tubes (Fig. 8).

Given the teachings of Aisin Seiki, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the heat exchanger of Demuth with the tubes are at least four, five or six rows of tubes.

Doing so would provide the appropriate heat exchanging tubular arrangement to satisfy a given heat exchanging requirement.

Re. Cls. 4 and 6, Demuth discloses the tubes are formed as flat tubes and the fins are formed as corrugated fins; and wherein medium can flow through the tubes of a row of tubes in parallel.

Re. Cls. 23-26, Demuth discloses the block has a finned end face with a height H and a width B, and in that the ratio of B/H is in the range from 0.8 to 1.2 (The finned end face in D1 has a height 260mm and a width 250 mm, the radio of H/W is 1.04, which is situated between the 0.8-1.2).

Re. Cl. 24, Demuth discloses the finned end face in D1 has a height with an approximately square in form of 200-360mm and a width with the range of 180-280 mm, the skilled person may easily assume the square form, such as height and width 200mm or height and width 28mm.

Re, Cl. 25, Demuth discloses the end face has a surface area A in a range from 4 dm2 to 16 dm2 (Page 25; lines 24-25).

Re. Cl. 26, Demuth discloses a gas cooler in a supercritical refrigeration cycle of a motor vehicle air-conditioning system, which is preferably operated with R744 (CO2) (Page 6; lines 27-28; page 13; line 29; page 14; lines 4-5).

Re. Cls. 10 and 12-13 Demuth fails to discloses that wherein all the rows of tubes are divided into tube segments through which medium can flow in series; the tube segments have approximately equal numbers of tubes; and wherein the ratio a/b of the numbers a, b of the tubes of two tube segments in a row of tubes is in a range from 0.7 to 1.35.

However, Aisin Seiki Co teaches rows of tubes are divided into tube segments through which medium can flow in series; the tube segments have approximately equal numbers of tubes; and wherein the ratio a/b of the numbers a, b of the tubes of two tube segments in a row of tubes is in a range from 0.7 to 1.35 (Fig. 8).

Given the teachings of Aisin Seiki, it would have been obvious to one of ordinary skill in the art at the time of the invention to further modify the heat exchanger of Demuth with all the rows of tubes are divided into tube segments through which medium can flow in series; the tube segments have approximately equal numbers of tubes; and wherein the ratio a/b of the numbers a, b of the tubes of two tube segments in a row of tubes is in a range from 0.7 to 1.35.

Doing so would provide a circular fluid flow path and the appropriate dimension for efficiently exchanging heat.

Re. Cls. 20-22, Demuth fails to disclose the flat tubes of different rows of tubes are arranged offset with respect to one another; the transverse pitch of the flat tubes is identical in all the rows of tubes; and wherein the transverse pitch of adjacent rows of tubes varies.

However, Aisin Seiki Co teaches the flat tubes of different rows of tubes are arranged offset with respect to one another (Fig. 8); the transverse pitch of the flat tubes is identical in all the rows of tubes (Fig. 8); and wherein the transverse pitch of adjacent rows of tubes varies

Given the teachings of Aisin Seiki, it would have been obvious to one of ordinary skill in the art at the time of the invention to further modify the heat exchanger of Demuth with the flat tubes of different rows of tubes are arranged offset with respect to one another; the transverse pitch of the flat tubes is identical in all the rows of tubes; and wherein the transverse pitch of adjacent rows of tubes varies.

Doing so would provide alternate tube arrangements for maximizing fluid flow heat transfer for efficiently exchanging heat.

5. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Demuth et al. (WO 03//054467) in view of Aisin Seiki Co. (JP 2000-304380) as applied to claims above, and further in view of Emrich et al. (WO 03/093751).

Re. Cl. 5, Demuth's invention as modified by Aisin Sieki, discloses all of the claimed limitations from above except for the flat tubes are formed as extruded multi chamber tubes.

However, Emrich teaches flat tubes are formed as extruded multi chamber tubes (Page 5, lines 5-15, Fig. 2)

Given the teachings of Emrich, it would have been obvious to one of ordinary skill in the art at the time of the invention to further modify the heat exchanger of Demuth with flat tubes formed as extruded multi chamber tubes.

Doing so would provide a multi chamber tubular structure with increase surface area and heat exchanging efficiency.

6. Claims 7-9, 11, 14-15 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Demuth et al. (WO 03//054467) in view of Aisin Seiki Co. (JP 2000-304380) as applied to claims above, and further in view of Hoglinger et al. (WO 03/046457).

Re. Cls. 7-9 and 11, Demuth's invention as modified by Aisin Sieki, discloses all of the claimed limitations from above except for medium can flow through the rows of tubes in series; at least one row of tubes is divided into tube segments with individual tubes through which medium can flow in succession; the rows of tubes which are divided into tube segments are arranged upstream of the undivided rows of tubes, as seen in the direction of flow of the gaseous medium; and wherein the tube segments have different numbers of tubes.

However, Hoglinger teaches medium can flow through the rows of tubes in series; at least one row of tubes is divided into tube segments with individual tubes through which medium can flow in succession (Fig. 4); the rows of tubes which are divided into tube segments are arranged upstream of the undivided rows of tubes, as seen in the direction of flow of the gaseous medium; and wherein the tube segments have different numbers of tubes.

Given the teachings of Hoglinger, it would have been obvious to one of ordinary skill in the art at the time of the invention to further modify the heat exchanger of Demuth with medium can flow through the rows of tubes in series; at least one row of tubes is divided into tube segments with individual tubes through which medium can flow in succession; the rows of tubes which are divided into tube segments are arranged

upstream of the undivided rows of tubes, as seen in the direction of flow of the gaseous medium; and wherein the tube segments have different numbers of tubes.

Doing so would improve heat exchanging efficiency of the heat exchanger.

Re. Cls. 14, 15, and 19, Demuth's invention as modified by Aisin Sieki, discloses all of the claimed limitations from above except for wherein the tube segments are connected by header tubes and are separated by partition walls in the header tubes; adjacent rows of tubes are connected to one another by diverter members (V); and wherein the flat tubes of different rows of tubes are arranged aligned with one another.

However, Hoglinger teaches for wherein the tube segments are connected by header tubes and are separated by partition walls in the header tubes (referring to fig. 18): tube segments in heat exchanger 1100 are connected by side trunk 1102 and 1103 (equaling to the header tubes in claim 14), and are separated by partition walls in the header tubes).; adjacent rows of tubes are connected to one another by diverter members (V) (Fig. 2); and wherein the flat tubes of different rows of tubes are arranged aligned with one another (Fig. 2).

Given the teachings of Hoglinger, it would have been obvious to one of ordinary skill in the art at the time of the invention to further modify the heat exchanger of Demuth with the tube segments are connected by header tubes and are separated by partition walls in the header tubes; adjacent rows of tubes are connected to one another by diverter members (V); and wherein the flat tubes of different rows of tubes are arranged aligned with one another.

Doing so would provide a structurally sounds thermally efficient heat exchanger that will withstand pressure and temperature changes.

7. Claims 16-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Demuth et al. (WO 03//054467) in view of Aisin Seiki Co. (JP 2000-304380) as applied to claims above, and further in view of Modine Manufacturing Co (EP 0608 439).

Re. Cls. 16-18, Demuth's invention as modified by Aisin Sieki, discloses all of the claimed limitations from above except corrugated fins of the individual rows of tubes are thermally decoupled; each case two rows of tubes have common, continuous corrugated fins; wherein all the rows of tubes have common, continuous corrugated fins.

However, Modine Manufacturing Co teaches corrugated fins of the individual rows of tubes are thermally decoupled (Fig. 6); each case two rows of tubes have common, continuous corrugated fins (Fig. 4); wherein all the rows of tubes have common, continuous corrugated fins (Fig. 4).

Given the teachings of Hoglinger, it would have been obvious to one of ordinary skill in the art at the time of the invention to further modify the heat exchanger of Demuth with corrugated fins of the individual rows of tubes are thermally decoupled; each case two rows of tubes have common, continuous corrugated fins; wherein all the rows of tubes have common, continuous corrugated fins.

Doing so would provide a thermally efficient fin structure for conducting heat away from tubular structures.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The following references cited on the PTO892 discloses related limitations of the applicant's claimed and disclosed invention.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to TERRELL L. MCKINNON whose telephone number is (571)272-4797. The examiner can normally be reached on Monday - Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cheryl Tyler can be reached on 571-272-4834. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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